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(54) **RECEIVER OF CARRIER SENSE MULTIPLEXING CONNECTION METHOD AND INTERFERENCE SUPPRESSING METHOD THEREOF**

EMPFÄNGER EINES MULTIPLEXVERBINDUNGSVERFAHRENS MIT TRÄGERKENNUNG UND STÖRUNTERDRÜCKUNGSVERFAHREN DAFÜR

RECEPTEUR DE CONNEXION DE MULTIPLEXAGE DE DETECTION DE PORTEUSE ET PROCEDE D'ELIMINATION DE BROUILLAGE

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Description

TECHNICAL FIELD

[0001] The present invention relates to a receiver using the carrier sense multiple access method and interference suppression method thereof, and more particularly, to a receiver that can improve the adjacent channel interference characteristic among a plurality of base stations and terminals and interference suppression method thereof.

BACKGROUND ART

[0002] In order to design/ configure a broadband packet radio communication system characterized by the carrier sense multiple access method such as an IEEE802.11a wireless LAN, it is especially important to design the arrangement of stations in such a manner as to enhance the entire capacity as well as ensuring stable throughput over broad areas.

[0003] In such station arrangement design, a repeat design for cells with a plurality of frequency channels in a multi-cluster structure is carried out by arranging the cells efficiently with consideration given to the same channel interference, etc. so that radio zones are sequentially extended.

[0004] When this method is applied to make the best use of available frequency bands designated by each country, it is not possible to avoid the arrangement of cells in frequency-position relation where two neighboring cells use adjacent frequency channels or next adjacent frequency channels depending on the cell repeat placement.

[0005] Fig. 1 is a diagram showing the configuration of the entire system for explaining problems involved in such frequency relation between cells. As can be seen in Fig. 1, a local channel base station (AP: Access Point) 22 secures as a local channel cell a service area 20, while an adjacent channel base station (AP: Access Point) 23 secures as an adjacent channel cell a service area 21.

[0006] Terminals 24 and 25 in the vicinity of the cell boundary area between the local channel service area 20 and adjacent channel service area 21 are connected to the local channel base station and adjacent channel base station, respectively. The terminal 24 is communicating with the local channel base station, and the terminal 25 is communicating with the adjacent channel base station. The two terminals 24 and 25 are at a short distance from each other, and far away from the respective base stations.

[0007] The terminals 24 and 25 are communicating with the respective base stations in a condition near the minimum sensitivity reception and maximum output transmission. In consequence, there is concern that the terminal 24, which is performing reception through a local channel, becomes incapable of reception due to interference caused by the transmission of the terminal 25 via an adjacent frequency channel at certain time.

[0008] In the case where the transmission and reception of the terminals are performed asynchronously without temporal correlation, a transmission and reception interference generator and a sufferer thereof may be reversed. Consequently, in the vicinity of the cell boundary area, the respective cells become dead zones and incommunicable areas between the cells increase, which causes reductions in the total area of communication cells, the coverage areas and capacity of the entire system, and throughput. This may produce the worst result that interference within the system damages the system itself.

[0009] In order to design a transmitter-receiver for avoiding that prospect, improvements in adjacent channel leakage power and spectrum mask are desired for the transmitting end, while highly selective design to enhance the tolerance for adjacent channel reception interference is essential for the receiving end.

[0010] The radio communication system characterized by the carrier sense multiple access method such as an IEEE802.11a wireless LAN is compatible with high-data-rate broadband. The occupied bandwidth of modulation transmission/ reception waves is considerably wide, and the modulation sidelobe is extended. In addition, the capacity is increased by narrowing the frequency channel interval as much as possible to use limited frequency resources effectively. Therefore, the relative merits of the entire radio communication system is determined by how to improve the ability to eliminate high level adjacent channel interference signals. In other words, this is the main technical key point in designing radio circuits.

[0011] In the above description, the adjacent channel interference reception problem arises between the terminals, however, the same adjacent channel interference reception problem may arise between the base stations (AP: Access Point).

[0012] Conceivably, the problem is caused in the case where two (or more) channel frequency cells are placed in the same service area to increase only the capacity of the base stations by a factor of two (or more). In this case, two (or more) base stations are placed in close proximity to each other in about the same service area, and therefore, it is not possible to avoid the arrangement of cells in frequency-position relation where the base stations use adjacent frequency channels or next adjacent frequency channels.

[0013] In such instances, as is obvious, adjacent channel interference occurs between terminals respectively belonging to the base stations depending on their positions, and further, the adjacent channel interference problem always arises between the base stations depending on a positional relation according to the arrangement of the base stations. Therefore, descriptions of the block configuration and operation of a receiver given hereinafter will apply to a receiver of the terminal and that of the base station.

[0014] Fig. 2 (prior art 1) and Fig. 3 (prior art 2) are diagrams each showing the block configuration of a conventional receiver used in a broadband packet radio communication system characterized by the carrier sense multiple access method. As shown in Fig. 2, in the configuration of the receiver according to the prior art 1, a radio frequency signal is received by an antenna 1, and sent to a low noise amplifier (LNA) 3 via a selector switch 2 to be amplified. The amplified signal and the output of a local oscillator (LO) 5 are input in a MIXER 4 to perform frequency conversion.

[0015] For the nth-order IF signal converted using such superheterodyne method, digital synchronous detection process is performed after IF sampling, or A/ D (Analog/ Digital) conversion process is performed after I/ Q separation using analog quasi-synchronous detection. In this case, an adjacent channel interference wave is suppressed by providing the nth-order IF section with a band fixed nth-order IF bandpass filter (BPF) 6 having a wideband characteristic (passband) equal to or wider than one-channel modulation occupied band width so as to secure the channel selectivity characteristic.

[0016] The output of the BPF 6 is connected to a received signal strength indicator (RSSI) 8 for carrier sensing the preamble of a received packet signal and a demodulator (DEMO) 9. The output of the RSSI 8 is sent to a carrier sense judgment device (CS) 10. When carrier sense is ON, the carrier sense judgment device (CS) 10 sends a demodulation start instruction to the DEMO 9.

[0017] As shown in Fig. 3, in the configuration of the receiver according to the prior art 2, a radio frequency signal is received by an antenna 1, and sent to a LNA 3 via a selector switch 2 to be amplified. The amplified signal and the output of a LO 5 are input in MIXERs 4 and 11 to perform frequency conversion directly to baseband.

[0018] For the baseband signal converted using such direct conversion method, quadrature detection (I/Q quadrature modulation/ quasi-synchronous detection) is performed. In this case, an adjacent channel interference wave is suppressed by providing baseband I/ Q sections with band fixed low-pass filters (LPF) 12 and 13 each having a cutoff frequency corresponding to one-channel modulation occupied band width (passband = one half of modulation occupied bandwidth) or more, respectively, so as to secure the channel selectivity characteristic (in the case of zero IF, LPF cutoff frequency = half or more than half of one channel).

[0019] The outputs from the LPFs 12 and 13 of the respective I/Q sections are connected to an RSSI 8 for carrier sensing the preamble of a received packet signal and a DEMO 9. The output of the RSSI 8 is sent to a CS 10. When carrier sense is ON, the CS 10 sends a demodulation start instruction to the DEMO 9.

[0020] Incidentally, the LPFs may be digital LPFs placed in digital baseband I/Q paths after IF sampling and digital synchronous detection process, or analog LPFs placed in analog I/Q baseband paths between analog quasi-synchronous detection and A/D conversion. Besides, both the digital LPF and analog LPF may be used to provide selectivity to the respective LPFs.

[0021] Fig. 4 is a diagram for explaining the reception operation of a conventional carrier sense multiple access system comprising a received signal strength indicator (RSSI) 8, a demodulator (DEMO) 9, and a carrier sense judgment device (CS) 10. As shown in Fig 4, when the signal wave of the preamble of a received packet signal is input, the RSSI 8 detects the electric field strength of the received signal in faithful accordance with time waveform (step 100). The output of the RSSI undergoes averaging operation in the CS 10, and is compared with a carrier sense threshold value. When the output after the averaging operation is determined to be equal to or more than the preset threshold value corresponding to the minimum reception sensitivity level, the CS 10 recognizes that "carrier sense is ON" (step 101), and accordingly, sends a demodulation start instruction to the DEMO 9 (step 102). Having received the demodulation start instruction, the DEMO 9 initiates the demodulation process (step 103).

[0022] US 4,910,794 A discloses selecting a relatively high data rate or a lower more conservative data rate for the transmission of a relatively lengthy message based on transmission of a test pattern at a suitable point in a communication protocol.

PROBLEMS THAT THE INVENTION IS TO SOLVE

[0023] In the following, a description will be given of problems in the aforementioned prior art 1 and 2 which arise when adjacent channel interference occurs. In a broadband packet radio communication system characterized by the carrier sense multiple access method operated on a harsh frequency arrangement where the occupied bandwidth of modulation transmission/ reception waves and modulation sidelobe are wide and the frequency channel interval is narrow, if the configuration as in the prior art is employed, a received signal connected to the RSSI 8 for carrier sensing the preamble of a received packet signal and a received signal connected to the DEMO 9 are subjected to band fixed channel filtering. As the band characteristic, a sufficiently wide passband is secured to pick up received signals from one channel. Therefore, when transmission and reception are carried out through a local channel with no adjacent channel interference, "carrier sense ON" can be detected by the RSSI output of a local channel reception wave without any problems, and thereby the normal demodulation process is performed.

[0024] However, in the radio environment where high level adjacent channel interference exists, problems arise with local channel reception. In accordance with the present invention, a broadband packet radio communication system characterized by the carrier sense multiple access method is operated on a frequency arrangement where the occupied bandwidth of modulation transmission/ reception waves and modulation sidelobe are

wider and the frequency channel interval is narrower. Therefore, in local channel reception waiting time (when RSSI operation continues), the adjacent leakage power spectra on both sides of an adjacent channel interference wave pass through a local channel band-limited filter.

[0025] In consequence, the power of the adjacent channel interference wave which has once leaked in cannot be discriminated on a reception standby system, and the unnecessary leakage adjacent channel interference power is propagated from the RSSI 8 to the CS 10. In the preamble processing procedure by a carrier sense judgment device of a high-speed radio communication standardized system, such as IEEE802.11a, whose functions are judged solely on power comparison, the adjacent channel interference signal is indistinguishable from a local channel carrier. Thus, an erroneous judgment, "carrier sense ON", is made.

[0026] Accordingly, carrier sense wrongly starts due to the high level adjacent channel interference wave input, resulting in erroneous operation in the reception/ demodulation process being the next reception process event. Thus, the loss of reception chances during the erroneous reception/ demodulation process (a period before the error is recognized later when received frames are assembled and false data are discarded) is substantially exposed, and the probability of transition from carrier sense based on local channel reception to normal demodulation start extremely decreases.

[0027] In other words, area coverage varies in the system as a whole, which leads to reductions in capacity and throughput, and the condition where it is difficult to form a continuous cell arrangement.

[0028] It is therefore an object of the present invention to improve the reception adjacent channel interference characteristic among a plurality of terminals as well as base stations in a broadband packet radio communication system characterized by the carrier sense multiple access method operated on a harsh frequency arrangement where an occupied band width of modulation transmission/ reception waves and modulation sidelobe are wide and the frequency channel interval is narrow.

DISCLOSURE OF THE INVENTION

[0029] In accordance with the present invention, to achieve the objects mentioned above, in a receiver in a packet radio communication system using the carrier sense multiple access method, a received signal to a received signal strength indicator is subjected to narrowband filtering, while the received signal to a demodulator is subjected to wideband filtering which filters the received signal by a wider band than that of the narrowband filtering.

[0030] By the narrowband channel filtering in the received signal strength detection operation, adjacent channel interference wave power components can be reduced as compared to local channel reception power components. Thus, correct reception/ demodulation operation can be implemented.

[0031] In accordance with another aspect of the present invention, the receiver is a superheterodyne receiver, electric field strength detection is performed for a received signal which has undergone frequency conversion from radio to intermediate frequency after filtering the received signal by a narrow bandpass filter, a carrier sense judgment is made based on the detection result, and in the case where the received signal is regarded as a carrier based on the judgment result, the received signal whose frequency has been converted to the intermediate frequency is demodulated after filtering the received signal by a wide bandpass filter.

[0032] In accordance with another aspect of the present invention, the receiver is a direct conversion or superheterodyne receiver having an I/Q baseband interface, electric field strength detection is performed for a received signal which has undergone frequency conversion from radio to baseband frequency after filtering the received signal by narrowband low-pass filters, a carrier sense judgment is made based on the detection result, and in the case where the received signal is regarded as a carrier based on the judgment result, the received signal whose frequency has been converted to the baseband frequency is demodulated after filtering the received signal by wideband low-pass filters.

[0033] In accordance with another aspect of the present invention, the receiver is a superheterodyne receiver, electric field strength detection is performed for a received signal which has undergone frequency conversion from radio to intermediate frequency after filtering the received signal by a variable bandpass filter controlled to have a narrowband characteristic, a carrier sense judgment is made based on the detection result, and in the case where the received signal is regarded as a carrier based on the judgment result, the received signal whose frequency has been converted to the intermediate frequency is demodulated after filtering the received signal by the variable bandpass filter controlled to have a wideband characteristic.

[0034] In accordance with another aspect of the present invention, the receiver is a direct conversion or superheterodyne receiver having an I/Q baseband interface, electric field strength detection is performed for a received signal which has undergone frequency conversion from radio to baseband frequency after filtering the received signal by variable low-pass filters controlled to have a narrowband characteristic, a carrier sense judgment is made based on the detection result, and in the case where the received signal is regarded as a carrier based on the judgment result, the received signal whose frequency has been converted to the baseband frequency is demodulated after filtering the received signal by the variable low-pass filters controlled to have a wideband characteristic.

[0035] In accordance with another aspect of the present invention, the variable bandpass filter or the variable low-pass filters is/ are controlled to have a narrow-

band characteristic in the initial state, and the narrowband characteristic is changed to a wideband characteristic when the received signal is regarded as a carrier based on the carrier sense judgment result.

[0036] In accordance with another aspect of the present invention, the bandpass filter having a narrowband characteristic is provided with a passband narrower than one-channel modulation occupied bandwidth, and the bandpass filter having a wideband characteristic is provided with a passband equal to or wider than the one-channel modulation occupied band width.

[0037] In accordance with another aspect of the present invention, the low-pass filters having a narrowband characteristic are provided with a passband narrower than one half-channel modulation occupied bandwidth, and the low-pass filters having a wideband characteristic are provided with a passband equal to or wider than the one half-channel modulation occupied band width.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038]

Fig. 1 is a diagram showing the configuration of an entire system for explaining problems involved in the cell relation between adjacent frequency channels.

Fig. 2 is a block diagram showing the configuration of a conventional receiver used in a broadband packet radio communication system characterized by the carrier sense multiple access method (prior art 1).

Fig. 3 is a block diagram showing the configuration of a conventional receiver used in a broadband packet radio communication system characterized by the carrier sense multiple access method (prior art 2).

Fig. 4 is a diagram for explaining the reception operation of a conventional carrier sense multiple access system comprising a received signal strength indicator (RSSI) 8, a demodulator (DEMO) 9, and a carrier sense judgment device (CS) 10.

Fig. 5 is a block diagram showing the configuration of a receiver used in a broadband packet radio communication system characterized by the carrier sense multiple access method according to the first embodiment of the present invention.

Fig. 6 is a diagram for explaining the operation of the receiver used in a broadband packet radio communication system characterized by the carrier sense multiple access method based on the configuration depicted in Fig. 5.

Fig. 7 is a block diagram showing the configuration of a receiver used in a broadband packet radio communication system characterized by the carrier sense multiple access method according to the second embodiment of the present invention.

Fig. 8 is a block diagram showing the configuration of a receiver used in a broadband packet radio communication system characterized by the carrier sense multiple access method according to the third embodiment of the present invention.

Fig. 9 is a block diagram showing the configuration of a receiver used in a broadband packet radio communication system characterized by the carrier sense multiple access method according to the fourth embodiment of the present invention.

[0039] Incidentally, the reference numeral 1 represents an antenna; the reference numeral 2 represents a selector switch; the reference numeral 3 represents a low noise amplifier (LNA); the reference numerals 4 and 11 represent MIXERs; the reference numeral 5 represents a local oscillator (LO); the reference numeral 6 represents a wideband fixed nth-order IF bandpass filter (BPF); the reference numeral 7 represents a narrowband fixed nth-order IF bandpass filter (BPF); the reference numeral 8 represents a received signal strength indicator (RSSI); the reference numeral 9 represents a demodulator (DEMO); the reference numeral 10 represents a carrier sense judgment device (CS) 10; the reference numerals 12 and 13 represent wideband fixed low-pass filters (LPF); the reference numerals 14 and 15 represent narrowband fixed low-pass filters (LPF); the reference numeral 16 represents a variable nth-order IF bandpass filter (BPF); the reference numerals 17 and 18 represent variable low-pass filters (LPF); the reference numeral 20 represents a local channel cell service area; the reference numeral 21 represents an adjacent channel cell service area; the reference numeral 22 represents a local channel base station (AP: Access Point); the reference numeral 23 represents an adjacent channel base station (AP: Access Point); and the reference numerals 24 and 25 represent terminals.

BEST MODE FOR CARRYING OUT THE INVENTION

[0040] Referring now to the drawings, an embodiment (first embodiment) of the present invention will be described. Fig. 5 is a block diagram showing the configuration of a receiver used in a broadband packet radio communication system characterized by the carrier sense multiple access method according to the first embodiment of the present invention. As shown in Fig. 5, in the configuration of the receiver according to the first embodiment of the present invention, a radio frequency signal is received by an antenna 1, and sent to a low noise amplifier (LNA) 3 via a selector switch 2 to be amplified. The amplified signal and the output of a local oscillator (LO) 5 are input in a MIXER 4 to perform frequency conversion.

[0041] For the nth-order IF signal converted using such superheterodyne method, digital synchronous detection process is performed after IF sampling, or A/D (Analog/Digital) conversion process is performed after quadrature demodulation to analog baseband using analog quasi-synchronous detection. In this case, an adjacent channel interference wave is suppressed by providing the nth-

order IF section with a band fixed nth-order IF bandpass filter (BPF) 6 having a wideband characteristic (passband) equal to or wider than one-channel modulation occupied band width so as to secure the channel selectivity characteristic. The output of the BPF 6 is connected to a demodulator (DEMO) 9.

[0042] The output of the band fixed nth-order IF bandpass filter (BPF) 6 is also connected to a received signal strength indicator (RSSI) 8 for carrier sensing the preamble of a received packet signal via a band fixed nth-order IF bandpass filter (BPF) 7 having a narrowband characteristic (passband) narrower than the one-channel modulation occupied bandwidth. The output of the RSSI 8 is sent to a carrier sense judgment device (CS) 10. When carrier sense is ON, the CS 10 sends a demodulation start instruction to the DEMO 9.

[0043] Incidentally, the nth-order IF signal may be input directly or via the wideband fixed nth-order IF BPF 6 to the narrowband fixed nth-order IF BPF 7.

[0044] Fig. 6 is a diagram for explaining the operation of the receiver used in a broadband packet radio communication system characterized by the carrier sense multiple access method based on the configuration depicted in Fig. 5. In Fig. 6, pattern diagram 1 shows, as reception level, a frame format of adjacent channel interference condition in the adjacent frequency cell boundary area shown in Fig. 1. The solid line indicates the spectrum of a signal received from a local channel: a local channel received signal (a), while the dashed line indicates the spectrum of a high level interference signal received from an adjacent channel: an adjacent channel interference signal (b).

[0045] As can be seen in pattern diagram 1 of Fig. 6, the frequency spectrum spreads and the assigned frequency interval is narrow. Consequently, the sidelobe power of adjacent channel interference wave spreading over wideband leaks in the band of the local channel before the channel band limit in respective RSSI and reception/ demodulation systems.

[0046] In this condition, both the RSSI and reception/ demodulation systems are band-limited with a wide passband equal to or wider than the one channel in conventional filtering techniques. In such cases, leakage adjacent channel interference wave power dominantly reaches to the RSSI system, and RSSI detection caused by the adjacent channel interference wave leads to a carrier sense error. Accordingly, reception operation wrongly starts, and all the following processes for the preamble of a received packet (AFC/ phase lock, timing detection, etc.) are erroneously performed, resulting in the loss of proper reception chances.

[0047] On the other hand, as can be seen in pattern diagram 2 of Fig. 6, by performing narrowband filtering in the reception/ RSSI system with the band fixed nth-order IF BPF 7 having a narrowband characteristic (passband) narrower than the one-channel modulation occupied bandwidth, adjacent channel interference wave power components can be reduced as compared to local channel reception power components. Thereby, correct received signal strength detection operation and carrier sense judgment operation can be implemented.

[0048] In other words, application of the present invention enables local channel reception in a broadband packet radio communication system characterized by the carrier sense multiple access method even when adjacent channel interference wave input is high. Thus, it is possible to configure a system that is highly resistant to adjacent channel interference wave.

[0049] Besides, as can be seen in pattern diagram 3 of Fig. 6, local channel filtering is performed in the reception/ demodulation system with the band fixed nth-order IF BPF 6 having a wideband characteristic (passband) equal to or wider than the one-channel modulation occupied band width as in the conventional techniques.

[0050] As is described above, the narrowband filtering, which is performed to decrease the domination of the RSSI system by an adjacent channel interference wave, increases the rate of successful carrier sense as well as the frequency with which necessary demodulation operation starts at proper time for the preamble of a packet from a local channel. When proper demodulation operation starts, local channel reception can be implemented with an ordinary error rate determined by the C/ (N + I) ratio by virtue of the wideband filter provided to the demodulation system. Thus, it is possible to maintain adequate communication quality efficiently with resistance to adjacent channel interference.

[0051] Incidentally, in the aforementioned C/ (N + I) ratio, C is the power of local channel received signal components cut off by wideband filtering; N is total noise power in the reception systems; and I is the power of adjacent channel interference wave that leaks in the local channel.

[0052] Additionally, it is obvious that, in accordance with the present invention, local channel reception performance equal or superior to that obtainable by the conventional techniques can be expected also in the case where an adjacent channel interference wave is low or there is no adjacent channel interference wave.

[0053] In the following, another embodiment (second embodiment) of the present invention will be described. Fig. 7 is a block diagram showing the configuration of a receiver used in a broadband packet radio communication system characterized by the carrier sense multiple access method according to the second embodiment of the present invention. As shown in Fig. 7, in the configuration of the receiver according to the second embodiment of the present invention, a radio frequency signal is received by an antenna 1, and sent to a low noise amplifier (LNA) 3 via a selector switch 2 to be amplified. The amplified signal and the output of a local oscillator (LO) 5 are input in MIXERs 4 and 11 to perform frequency conversion directly to baseband.

[0054] For the baseband signal converted using such direct conversion method, quadrature detection (I/Q quadrature modulation/ quasi-synchronous detection) is performed. In this case, an adjacent channel interference

wave is suppressed by providing baseband I/Q sections with wideband fixed low-pass filters (LPF) 12 and 13 each having a cutoff frequency corresponding to one-channel modulation occupied band width (passband = one half of modulation occupied bandwidth) or more, respectively, so as to secure the channel selectivity characteristic. The outputs from the LPFs 12 and 13 of the respective I/Q sections are connected to a demodulator (DEMO) 9.

[0055] The outputs from the band fixed low-pass filters (LPF) 12 and 13 of the respective baseband I/Q sections are also connected to a received signal strength indicator (RSSI) 8 for carrier sensing the preamble of a received packet signal via narrowband fixed low-pass filters (LPF) 14 and 15 each having a cutoff frequency corresponding to less than the one-channel modulation occupied band width (passband = one half of modulation occupied bandwidth). The output of the RSSI 8 is sent to a carrier sense judgment device (CS) 10. When carrier sense is ON, the carrier sense judgment device (CS) 10 sends a demodulation start instruction to the DEMO 9.

[0056] Incidentally, the baseband signal may be input directly or via the wideband fixed LPFs 12 and 13 to the narrowband fixed LPFs 14 and 15.

[0057] That is, the circuitry according to the second embodiment is characterized in that, in the configuration of the direct conversion receiver, narrowband channel filtering (with narrowband LPFs each having a passband narrower than one half of one-channel occupied band width) and wideband channel filtering (with wideband LPFs each having a passband equal to or wider than one half of one-channel occupied bandwidth) are performed in an RSSI system and a reception/ demodulation system, respectively.

[0058] As in the first embodiment, the narrowband filtering, which is performed to decrease the domination of the RSSI system by an adjacent channel interference wave, increases the rate of successful carrier sense as well as the frequency with which necessary demodulation operation starts at proper time for the preamble of a packet from a local channel. When proper demodulation operation starts, local channel reception can be implemented with an ordinary error rate determined by the C/ (N + I) ratio by virtue of the wideband filters provided to the demodulation system. Thus, it is possible to maintain adequate communication quality efficiently with resistance to adjacent channel interference.

[0059] Incidentally, in the case where the superheterodyne receiver of the first embodiment has an I/Q baseband interface and perform analog quasi-synchronous detection for the nth-order IF signal, wideband fixed low-pass filters (LPF) 12 and 13, each having a cutoff frequency corresponding to one-channel modulation occupied band width (passband = one half of modulation occupied bandwidth) or more, are inserted in baseband I/Q sections, respectively, and the outputs therefrom are connected to the demodulator (DEMO) 9 as in the second embodiment. Besides, the outputs from the band fixed low-pass filters (LPF) 12 and 13 are also connected to the received signal strength indicator (RSSI) 8 via narrowband fixed low-pass filters (LPF) 14 and 15 each having a cutoff frequency corresponding to less than the one-channel modulation occupied band width (passband = one half of modulation occupied bandwidth).

[0060] In the following, yet another embodiment (third embodiment) of the present invention will be described. Fig. 8 is a block diagram showing the configuration of a receiver used in a broadband packet radio communication system characterized by the carrier sense multiple access method according to the third embodiment of the present invention. As shown in Fig. 8, in the configuration of the receiver according to the third embodiment of the present invention, a radio frequency signal is received by an antenna 1, and sent to a low noise amplifier (LNA) 3 via a selector switch 2 to be amplified. The amplified signal and the output of a local oscillator (LO) 5 are input in a MIXER 4 to perform frequency conversion.

[0061] For the nth-order IF signal converted using such superheterodyne method, digital synchronous detection process is performed after IF sampling, or A/D (Analog/ Digital) conversion process is performed after quadrature demodulation to analog baseband using analog quasi-synchronous detection. In this case, an adjacent channel interference wave is suppressed by providing the nth-order IF section with a variable nth-order IF bandpass filter (BPF) 16, which is controlled to have a narrowband characteristic (passband) narrower than the one-channel modulation occupied bandwidth during initial RSSI standby operation in reception and controlled to have a wideband characteristic (passband) equal to or wider than one-channel modulation occupied band width during subsequent demodulation operation in reception so as to secure the channel selectivity characteristic.

[0062] The output of the BPF 16 is connected to an RSSI 8 for carrier sensing the preamble of a received packet signal and a DEMO 9. The output of the RSSI 8 is sent to a CS 10. When carrier sense is ON, the CS 10 sends a demodulation start instruction to the DEMO 9.

[0063] In this embodiment, the carrier sense judgment device (CS) 10 electrically controls the variable bandpass filter (BPF) 16 to set its bandwidth to narrow or wide. In the initial state, the variable BPF 16 has a narrowband characteristic in response to the detection operation of the RSSI. The RSSI 8 detects the electric field strength of the preamble of a received packet signal. When having determined that carrier sense is ON, the CS 10 sends the variable BPF 16 a signal to switch the narrowband characteristic to a wideband characteristic. Thereby, the received signal is demodulated after wideband channel filtering.

[0064] That is, the circuitry according to the third embodiment is characterized in that, in the configuration of the superheterodyne receiver, there is provided a variable BPF witch can be controlled so that narrowband channel filtering is performed during RSSI standby operation while wideband channel filtering is performed during subsequent reception/ demodulation operation.

[0065] As in the first embodiment, the narrowband filtering, which is performed to decrease the domination of the RSSI system by an adjacent channel interference wave, increases the rate of successful carrier sense as well as the frequency with which necessary demodulation operation starts at proper time for the preamble of a packet from a local channel. When proper demodulation operation starts, local channel reception can be implemented with an ordinary error rate determined by the C/ (N + I) ratio by virtue of the wideband filtering. Thus, it is possible to maintain adequate communication quality efficiently with resistance to adjacent channel interference.

[0066] In the following, yet another embodiment (fourth embodiment) of the present invention will be described. Fig. 9 is a block diagram showing the configuration of a receiver used in a broadband packet radio communication system characterized by the carrier sense multiple access method according to the fourth embodiment of the present invention. As shown in Fig. 9, in the configuration of the receiver according to the fourth embodiment of the present invention, a radio frequency signal is received by an antenna 1, and sent to a low noise amplifier (LNA) 3 via a selector switch 2 to be amplified. The amplified signal and the output of a local oscillator (LO) 5 are input in MIXERs 4 and 11 to perform frequency conversion directly to baseband.

[0067] For the baseband signal converted using such direct conversion method, quadrature detection (I/Q quadrature modulation/ quasi-synchronous detection) is performed. In this case, an adjacent channel interference wave is suppressed by providing baseband I/Q sections with variable low-pass filters (LPF) 17 and 18, each of which is controlled to have a narrowband characteristic or a cutoff frequency corresponding to less than one-channel modulation occupied band width (passband = one half of modulation occupied bandwidth) during initial RSSI standby operation in reception and controlled to have a wideband characteristic or a cutoff frequency corresponding to the one-channel modulation occupied band width (passband = one half of modulation occupied bandwidth) or more during subsequent demodulation operation in reception so as to secure the channel selectivity characteristic.

[0068] The outputs from the LPFs 17 and 18 of the respective I/Q sections are connected to an RSSI 8 for carrier sensing the preamble of a received packet signal and a DEMO 9. The output of the RSSI 8 is sent to a CS 10. When carrier sense is ON, the CS 10 sends a demodulation start instruction to the DEMO 9.

[0069] In this embodiment, the carrier sense judgment device (CS) 10 electrically controls the variable low-pass filters (LPF) 17 and 18 to set their bandwidths to narrow or wide. In the initial state, the variable LPFs 17 and 18 each have a narrowband characteristic in response to the detection operation of the RSSI. The RSSI 8 detects the electric field strength of the preamble of a received packet signal. When having determined that carrier sense is ON, the CS 10 sends each of the variable LPFs 17 and 18 a signal to switch the narrowband characteristic to a wideband characteristic. Thereby, the received signal is demodulated after wideband channel filtering.

[0070] That is, the circuitry according to the fourth embodiment is characterized in that, in the configuration of the direct conversion receiver, there is provided variable LPFs witch can be controlled so that narrowband channel filtering is performed during RSSI standby operation while wideband channel filtering is performed during subsequent reception/ demodulation operation.

[0071] As in the first embodiment, the narrowband filtering, which is performed to decrease the domination of the RSSI system by an adjacent channel interference wave, increases the rate of successful carrier sense as well as the frequency with which necessary demodulation operation starts at proper time for the preamble of a packet from a local channel. When proper demodulation operation starts, local channel reception can be implemented with an ordinary error rate determined by the C/ (N + I) ratio by virtue of the wideband filtering. Thus, it is possible to maintain adequate communication quality efficiently with resistance to adjacent channel interference.

[0072] Incidentally, in the case where the superheterodyne receiver of the third embodiment has an I/Q baseband interface and perform analog quasi-synchronous detection for the nth-order IF signal, baseband I/Q sections are provided with variable low-pass filters (LPF) 17 and 18, each of which is controlled to have a narrowband characteristic or a cutoff frequency corresponding to less than one-channel modulation occupied band width (passband = one half of modulation occupied bandwidth) during initial RSSI standby operation in reception and controlled to have a wideband characteristic or a cutoff frequency corresponding to the one-channel modulation occupied band width (passband = one half of modulation occupied bandwidth) or more during subsequent demodulation operation in reception, respectively, and the outputs therefrom are connected to the RSSI 8 and the DEMO 9 as in the fourth embodiment.

INDUSTRIAL APPLICABILITY

[0073] As set forth hereinabove, in accordance with the present invention, narrowband channel filtering and wideband channel filtering are performed in an RSSI system and a reception/ demodulation system, respectively. Thereby, it is possible to improve the reception adjacent channel interference characteristic among a plurality of terminals as well as base stations in a broadband packet radio communication system characterized by the carrier sense multiple access method operated on a harsh frequency arrangement where an occupied band width of modulation transmission/ reception waves and modulation sidelobe are wide and the frequency channel interval is narrow.

[0074] Besides, even when high level adjacent channel interference wave is generated, it is possible to minimize the loss of reception chances from the wrong start

of carrier sense due to the high level adjacent channel interference wave input and the following erroneous operation in the reception/ demodulation process: the next reception process event, in the initial stage of received packet preamble processing. Thus, the probability of transition from carrier sense based on local channel reception to normal demodulation start can be increased.

[0075] That is, in accordance with the present invention, there is proposed a reception system capable of stable local channel reception/ demodulation operation such that the demodulation operation achieves completion. Consequently, it is possible to ensure the area coverage and capacity of the entire system as well as a wide range of system operations with high throughput and continuous cell arrangement.

Claims

1. A packet radio communication system comprising a receiver, the receiver being configured to use the carrier sense multiple access method,
characterized in that the receiver comprises a narrowband filter configured to receive a signal, to narrowband filter the signal and to output the narrowband filtered signal to a received signal strength indicator; and
the receiver comprises a wideband filter configured to receive the signal to wideband filter the signal by a wider band than that of the narrowband filter and to output the wideband filtered signal to a demodulator.

2. The system as claimed in claim 1, wherein:

the receiver is a superheterodyne receiver;
the narrowband filter is a narrow bandpass filter (7);
the received signal strength indicator (8) is configured to perform electric field strength detection for the received signal which has undergone frequency conversion from radio to intermediate frequency;
the receiver is configured to make a carrier sense judgment based on the detection result;
the demodulator (9) is configured to demodulate the received signal whose frequency has been converted to the intermediate frequency in the case where the received signal is regarded as a carrier based on the judgment result, and
the wideband filter is a wide bandpass filter (6).

3. The system as claimed in claim 1, wherein:

the receiver is a superheterodyne receiver;
the narrowband filter is narrowband low-pass filters (14, 15);
the received signal strength indicator (8) is configured to perform electric field strength detection for the received signal which has undergone frequency conversion from radio to baseband frequency;
the receiver is configured to make a carrier sense judgment based on the detection result;
the demodulator (9) is configured to carry out demodulation of the received signal whose frequency has been converted to the baseband frequency in the case where the received signal is regarded as a carrier based on the judgment result; and
the wideband filter is wideband low-pass filters (12, 13).

4. The system as claimed in claim 1, wherein:

the receiver is a direct conversion receiver;
the narrowband filter is narrowband low-pass filters (14, 15);
the received signal strength indicator (8) is configured to perform electric field strength detection for the received signal which has undergone frequency conversion from radio to baseband frequency;
the receiver is configured to make a carrier sense judgment based on the detection result;
the demodulator (9) is configured to carry out demodulation of the received signal whose frequency has been converted to the baseband frequency in the case where the received signal is regarded as a carrier based on the judgment result; and
the wideband filter is wideband low-pass filters (12, 13).

5. The system as claimed in claim 1, wherein:

the receiver is a superheterodyne receiver;
the narrowband filter is a variable bandpass filter (16) controlled to have a narrowband characteristic;
the received signal strength indicator (8) is configured to perform electric field strength detection for the received signal which has undergone frequency conversion from radio to intermediate frequency;
the receiver is configured to make a carrier sense judgment based on the detection result;
the demodulator (9) is configured to demodulate the received signal whose frequency has been converted to the intermediate frequency in the case where the received signal is regarded as a carrier based on the judgment result, and
the wideband filter is the variable bandpass filter (16) controlled to have a wideband characteristic.

6. The system as claimed in claim 1, wherein:

the receiver is a superheterodyne receiver;
the narrowband filter is variable low-pass filters (17, 18) controlled to have a narrowband characteristic;
the received signal strength indicator (8) is configured to perform electric field strength detection for the received signal which has undergone frequency conversion from radio to baseband frequency;
the receiver is configured to make a carrier sense judgment based on the detection result;
the demodulator (9) is configured to carry out demodulation of the received signal whose frequency has been converted to the baseband frequency in the case where the received signal is regarded as a carrier based on the judgment resultand
the wideband filter is the variable low-pass filters (17, 18) controlled to have a wideband characteristic.

7. The system as claimed in claim 1, wherein:

the receiver is a direct conversion receiver;
the narrowband filter is variable low-pass filters (17, 18) controlled to have a narrowband characteristic;
the received signal strength indicator (8) is configured to perform electric field strength detection for the received signal which has undergone frequency conversion from radio to baseband frequency;
the receiver is configured to make a carrier sense judgment based on the detection result;
the demodulator (9) is configured to carry out demodulation of the received signal whose frequency has been converted to the baseband frequency in the case where the received signal is regarded as a carrier based on the judgment result and
the wideband filter is the variable low-pass filters (17, 18) controlled to have a wideband characteristic.

8. The system claimed in one of claims 5 to 7, wherein:

the receiver is configured to control the variable bandpass filter or the variable low-pass filters to have a narrowband characteristic in the initial state; and
to change the narrowband characteristic to a wideband characteristic when the received signal is regarded as a carrier based on the carrier sense judgment result.

9. The system claimed in claim 2 or 5, wherein:

the bandpass filter having a narrowband characteristic is provided with a passband narrower than one-channel modulation occupied bandwidth; and
the bandpass filter having a wideband characteristic is provided with a passband equal to or wider than the one-channel modulation occupied band width.

10. The system claimed in one of claims 3, 4, 6 and 7, wherein:

the low-pass filters having a narrowband characteristic are provided with a passband narrower than one half-channel modulation occupied bandwidth; and
the low-pass filters having a wideband characteristic are provided with a passband equal to or wider than the one half-channel modulation occupied band width.

11. An interference suppression method for a packet radio communication system comprising a receiver using the carrier sense multiple access method, **characterized by** comprising the steps of:

detecting the electric field strength of a received signal after narrowband filtering; and
demodulating the received signal after wideband filtering which filters the received signal by a wider band than that of the narrowband filtering.

12. The interference suppression method as claimed in claim 11, further comprising the step of:

making a carrier sense judgment based on the detection result, wherein
the method is carried out in a superheterodyne receiver;
the received signal has undergone frequency conversion from radio to intermediate frequency;
narrowband filtering the received signal is carried out by a narrow bandpass filter (7);
in the case where the received signal is regarded as a carrier based on the judgment result, demodulating the received signal whose frequency has been converted to the intermediate frequency is carried out; and
wideband filtering the received signal is carried out by a wide bandpass filter (7).

13. The interference suppression method as claimed in claim 11, further comprising the step of:

making a carrier sense judgment based on the detection result, wherein

the method is carried out in a direct conversion receiver;
narrowband filtering the received signal is carried out by narrowband low-pass filters (14, 15);
the received signal has undergone frequency conversion from radio to baseband frequency;
in the case where the received signal is regarded as a carrier based on the judgment result, demodulating the received signal whose frequency has been converted to the baseband frequency is carried out; and
wideband filtering the received signal is carried out by wideband low-pass filters (14, 15).

14. The interference suppression method as claimed in claim 11, further comprising the step of:

making a carrier sense judgment based on the detection result, wherein
the method is carried out in a direct conversion receiver;
narrowband filtering the received signal is carried out by narrowband low-pass filters (14, 15);
the received signal has undergone frequency conversion from radio to baseband frequency;
in the case where the received signal is regarded as a carrier based on the judgment result, demodulating the received signal whose frequency has been converted to the baseband frequency is carried out; and
wideband filtering the received signal is carried out by wideband low-pass filters (14, 15).

15. The interference suppression method as claimed in claim 11, further comprising the step of:

making a carrier sense judgment based on the detection result, wherein
the method is carried out in a superheterodyne receiver;
narrowband filtering the received signal is carried out by a variable bandpass filter (16) controlled to have a narrowband characteristic;
the received signal has undergone frequency conversion from radio to intermediate frequency;
in the case where the received signal is regarded as a carrier based on the judgment result, demodulating the received signal whose frequency has been converted to the intermediate frequency is carried out; and
wideband filtering the received signal is carried out by the variable bandpass filter (16) controlled to have a wideband characteristic.

16. The interference suppression method as claimed in claim 11, further comprising the step of:

making a carrier sense judgment based on the detection result, wherein
the method is carried out in a superheterodyne receiver;
narrowband filtering the received signal is carried out by variable low-pass filters (17, 18) controlled to have a narrowband characteristic;
the received signal has undergone frequency conversion from radio to baseband frequency;
in the case where the received signal is regarded as a carrier based on the judgment result, demodulating the received signal whose frequency has been converted to the baseband frequency is carried out; and
wideband filtering the received signal is carried out by the variable low-pass filters (17, 18) controlled to have a wideband characteristic.

17. The interference suppression method as claimed in claim 11, further comprising the step of:

making a carrier sense judgment based on the detection result, wherein
the method is carried out in a direct conversion receiver;
narrowband filtering the received signal is carried out by variable low-pass filters (17, 18) controlled to have a narrowband characteristic;
the received signal has undergone frequency conversion from radio to baseband frequency;
in the case where the received signal is regarded as a carrier based on the judgment result, demodulating the received signal whose frequency has been converted to the baseband frequency is carried out; and
wideband filtering the received signal is carried out by the variable low-pass filters (17, 18) controlled to have a wideband characteristic.

18. The interference suppression method claimed in one of claims 15 to 17, wherein:

the variable bandpass filter or the variable low-pass filters is/ are controlled to have a narrowband characteristic in the initial state; and
the narrowband characteristic is changed to a wideband characteristic when the received signal is regarded as a carrier based on the carrier sense judgment result.

19. The interference suppression method claimed in claim 12 or 15, wherein:

the bandpass filter having a narrowband characteristic is provided with a passband narrower than one-channel modulation occupied bandwidth; and
the bandpass filter having a wideband charac-

teristic is provided with a passband equal to or wider than the one-channel modulation occupied band width.

20. The interference suppression method claimed in one of claims 13, 14, 16 and 17, wherein:

the low-pass filters having a narrowband characteristic are provided with a passband narrower than one half-channel modulation occupied bandwidth; and
the low-pass filters having a wideband characteristic are provided with a passband equal to or wider than the one half-channel modulation occupied band width.

Patentansprüche

1. Packet-Radio-Kommunikationssystem, das einen Empfänger umfasst, wobei der Empfänger zur Verwendung des Carrier Sense Multiple Access Verfahrens konfiguriert ist,
dadurch gekennzeichnet, dass der Empfänger ein Schmalbandfilter umfasst, das zum Empfangen eines Signals, zum Schmalbandfiltern des Signals und zum Ausgeben des schmalbandgefilterten Signals an eine Empfangssignalstärkenanzeige konfiguriert ist; und
der Empfänger ein Breitbandfilter umfasst, das zum Empfangen des Signals, zum Breitbandfiltern des Signals durch ein breiteres Band als jenes des Schmalbandfilters und zum Ausgeben des breitbandgefilterten Signals an einen Demodulator konfiguriert ist.

2. System gemäß Anspruch 1, wobei:

der Empfänger ein Superheterodynempfänger ist;
das Schmalbandfilter ein schmales Bandpassfilter (7) ist;
die Empfangssignalstärkenanzeige (8) zum Durchführen einer Erfassung der elektrischen Feldstärke für das empfangene Signal, das einer Frequenzumwandlung von Funk- auf Zwischenfrequenz unterworfen wurde, konfiguriert ist;
der Empfänger zum Durchführen einer Beurteilung der Trägerprüfung (Carrier sense) basierend auf dem Erfassungsergebnis konfiguriert ist;
der Demodulator (9) zum Demodulieren des empfangenen Signals, dessen Frequenz in die Zwischenfrequenz umgewandelt worden ist, wenn das empfangene Signal basierend auf dem Beurteilungsergebnis als ein Träger betrachtet wird, konfiguriert ist und
das Breitbandfilter ein breites Bandpassfilter (6) ist.

3. System gemäß Anspruch 1, wobei:

der Empfänger ein Superheterodynempfänger ist;
das Schmalbandfilter Schmalband-Tiefpassfilter (14, 15) ist;
die Empfangssignalstärkenanzeige (8) zum Durchführen einer Erfassung der elektrischen Feldstärke für das empfangene Signal, das einer Frequenzumwandlung von Funk- auf Basisbandfrequenz unterworfen wurde, konfiguriert ist;
der Empfänger zum Durchführen einer Beurteilung der Trägerprüfung (Carrier sense) basierend auf dem Erfassungsergebnis konfiguriert ist;
der Demodulator (9) zum Demodulieren des empfangenen Signals, dessen Frequenz in die Basisbandfrequenz umgewandelt worden ist, wenn das empfangene Signal basierend auf dem Beurteilungsergebnis als ein Träger betrachtet wird, konfiguriert ist und
das Breitbandfilter Breitband-Tiefpassfilter (12, 13) ist.

4. System gemäß Anspruch 1, wobei:

der Empfänger ein Direktmischempfänger ist;
das Schmalbandfilter Schmalband-Tiefpassfilter (14, 15) ist;
die Empfangssignalstärkenanzeige (8) zum Durchführen einer Erfassung der elektrischen Feldstärke für das empfangene Signal, das einer Frequenzumwandlung von Funk- auf Basisbandfrequenz unterworfen wurde, konfiguriert ist;
der Empfänger zum Durchführen einer Beurteilung der Trägerprüfung (Carrier sense) basierend auf dem Erfassungsergebnis konfiguriert ist;
der Demodulator (9) zum Demodulieren des empfangenen Signals, dessen Frequenz in die Basisbandfrequenz umgewandelt worden ist, wenn das empfangene Signal basierend auf dem Beurteilungsergebnis als ein Träger betrachtet wird, konfiguriert ist und
das Breitbandfilter Breitband-Tiefpassfilter (12, 13) ist.

5. System gemäß Anspruch 1, wobei:

der Empfänger ein Superheterodynempfänger ist;
das Schmalbandfilter ein variables Bandpassfilter (16) ist, das so gesteuert wird, dass es eine

Schmalbandcharakteristik aufweist;
die Empfangssignalstärkenanzeige (8) zum Durchführen einer Erfassung der elektrischen Feldstärke für das empfangene Signal, das einer Frequenzumwandlung von Funk- auf Zwischenfrequenz unterworfen wurde, konfiguriert ist;
der Empfänger zum Durchführen einer Beurteilung der Trägerprüfung (Carrier sense) basierend auf dem Erfassungsergebnis konfiguriert ist;
der Demodulator (9) zum Demodulieren des empfangenen Signals, dessen Frequenz in die Zwischenfrequenz umgewandelt worden ist, wenn das empfangene Signal basierend auf dem Beurteilungsergebnis als ein Träger betrachtet wird, konfiguriert ist und
das Breitbandfilter das variable Bandpassfilter (16) ist, das so gesteuert wird, dass es eine Breitbandcharakteristik aufweist.

6. System gemäß Anspruch 1, wobei:

der Empfänger ein Superheterodynempfänger ist;
das Schmalbandfilter variable Tiefpassfilter (17, 18) ist, die so gesteuert werden, dass sie eine Schmalbandcharakteristik aufweisen;
die Empfangssignalstärkenanzeige (8) zum Durchführen einer Erfassung der elektrischen Feldstärke für das empfangene Signal, das einer Frequenzumwandlung von Funk- auf Basisbandfrequenz unterworfen wurde, konfiguriert ist;
der Empfänger zum Durchführen einer Beurteilung der Trägerprüfung (Carrier sense) basierend auf dem Erfassungsergebnis konfiguriert ist;
der Demodulator (9) zum Demodulieren des empfangenen Signals, dessen Frequenz in die Basisbandfrequenz umgewandelt worden ist, wenn das empfangene Signal basierend auf dem Beurteilungsergebnis als ein Träger betrachtet wird, konfiguriert ist und
das Breitbandfilter die variablen Tiefpassfilter (17, 18) ist, die so gesteuert werden, dass sie eine Breitbandcharakteristik aufweisen.

7. System gemäß Anspruch 1, wobei:

der Empfänger ein Direktmischempfänger ist;
das Schmalbandfilter variable Tiefpassfilter (17, 18) ist, die so gesteuert werden, dass sie eine Schmalbandcharakteristik aufweisen;
die Empfangssignalstärkenanzeige (8) zum Durchführen einer Erfassung der elektrischen Feldstärke für das empfangene Signal, das einer Frequenzumwandlung von Funk- auf Basisbandfrequenz unterworfen wurde, konfiguriert ist;
der Empfänger zum Durchführen einer Beurteilung der Trägerprüfung (Carrier sense) basierend auf dem Erfassungsergebnis konfiguriert ist;
der Demodulator (9) zum Demodulieren des empfangenen Signals, dessen Frequenz in die Basisbandfrequenz umgewandelt worden ist, wenn das empfangene Signal basierend auf dem Beurteilungsergebnis als ein Träger betrachtet wird, konfiguriert ist und
das Breitbandfilter die variablen Tiefpassfilter (17, 18) ist, die so gesteuert werden, dass sie eine Breitbandcharakteristik aufweisen.

8. System gemäß einem der Ansprüche 5 bis 7, wobei:

der Empfänger konfiguriert ist zum Steuern des variablen Bandpassfilters oder der variablen Tiefpassfilter, sodass sie im Anfangszustand eine Schmalbandcharakteristik aufweisen; und
zum Ändern der Schmalbandcharakteristik in eine Breitbandcharakteristik, wenn das empfangene Signal basierend auf dem Beurteilungsergebnis der Trägerprüfung (Carrier sense) als ein Träger betrachtet wird.

9. System gemäß Anspruch 2 oder 5, wobei:

das Bandpassfilter, das eine Schmalbandcharakteristik aufweist, mit einem Durchgangsband bereitgestellt ist, das schmaler als die durch Einkanalmodulation belegte Bandbreite ist; und
das Bandpassfilter, das eine Breitbandcharakteristik aufweist, mit einem Durchgangsband bereitgestellt ist, dass gleich oder breiter als die durch Einkanalmodulation belegte Bandbreite ist.

10. System gemäß einem der Ansprüche 3, 4, 6 und 7, wobei:

die Tiefpassfilter, die eine Schmalbandcharakteristik aufweisen, mit einem Durchgangsband bereitgestellt sind, das schmaler als die durch Einhalbkanalmodulation belegte Bandbreite ist; und
die Tiefpassfilter, die eine Breitbandcharakteristik aufweisen, mit einem Durchgangsband bereitgestellt sind, dass gleich oder breiter als die durch Einhalbkanalmodulation belegte Bandbreite ist.

11. Störungsunterdrückungsverfahren für ein Packet-Radio-Kommunikationssystem, das einen Empfänger umfasst, der das Carrier Sense Multiple Access Verfahrens verwendet, **dadurch gekennzeichnet,**

dass es die Schritte umfasst:

Erfassen der elektrischen Feldstärke eines empfangenen Signals nach Schmalbandfilterung; und
Demodulieren des empfangenen Signals nach Breitbandfilterung, die das empfangene Signal durch ein breiteres Band als jenes der Schmalbandfilters filtert.

12. Störungsunterdrückungsverfahren gemäß Anspruch 11, das weiter den Schritt umfasst:

Durchführen einer Beurteilung einer Trägerprüfung (Carrier sense) basierend auf dem Erfassungsergebnis, wobei das Verfahren in einem Superheterodynempfänger ausgeführt wird;
das empfangene Signal einer Frequenzumwandlung von Funk- auf Zwischenfrequenz unterworfen wurde;
Schmalbandfilterung des empfangenen Signals durch ein schmales Bandpassfilter (7) ausgeführt wird;
wenn das empfangene Signal basierend auf dem Beurteilungsergebnis als ein Träger betrachtet wird, Demodulation des empfangenen Signals, dessen Frequenz in die Zwischenfrequenz umgewandelt wurde, ausgeführt wird; und
Breitbandfilterung des empfangenen Signals durch ein breites Bandpassfilter (7) ausgeführt wird.

13. Störungsunterdrückungsverfahren gemäß Anspruch 11, das weiter den Schritt umfasst:

Durchführen einer Beurteilung einer Trägerprüfung (Carrier sense) basierend auf dem Erfassungsergebnis, wobei das Verfahren in einem Direktmischempfänger ausgeführt wird;
Schmalbandfilterung des empfangenen Signals durch Schmalband-Tiefpassfilter (14, 15) ausgeführt wird;
das empfangene Signal einer Frequenzumwandlung von Funk- auf Basisbandfrequenz unterworfen wurde;
wenn das empfangene Signal basierend auf dem Beurteilungsergebnis als ein Träger betrachtet wird, Demodulation des empfangenen Signals, dessen Frequenz in die Basisbandfrequenz umgewandelt wurde, ausgeführt wird; und
Breitbandfilterung des empfangenen Signals durch Breitband-Tiefpassfilter (14, 15) ausgeführt wird.

14. Störungsunterdrückungsverfahren gemäß Anspruch 11, das weiter den Schritt umfasst:

Durchführen einer Beurteilung einer Trägerprüfung (Carrier sense) basierend auf dem Erfassungsergebnis, wobei das Verfahren in einem Direktmischempfänger ausgeführt wird;
Schmalbandfilterung des empfangenen Signals durch Schmalband-Tiefpassfilter (14, 15) ausgeführt wird;
das empfangene Signal einer Frequenzumwandlung von Funk- auf Basisbandfrequenz unterworfen wurde;
wenn das empfangene Signal basierend auf dem Beurteilungsergebnis als ein Träger betrachtet wird, Demodulation des empfangenen Signals, dessen Frequenz in die Basisbandfrequenz umgewandelt wurde, ausgeführt wird; und
Breitbandfilterung des empfangenen Signals durch Breitband-Tiefpassfilter (14, 15) ausgeführt wird.

15. Störungsunterdrückungsverfahren gemäß Anspruch 11, das weiter den Schritt umfasst:

Durchführen einer Beurteilung einer Trägerprüfung (Carrier sense) basierend auf dem Erfassungsergebnis, wobei das Verfahren in einem Superheterodynempfänger ausgeführt wird;
Schmalbandfilterung des empfangenen Signals durch ein variables Bandpassfilter (16), das so gesteuert wird, dass es eine Schmalbandcharakteristik aufweist, ausgeführt wird;
das empfangene Signal einer Frequenzumwandlung von Funk- auf Zwischenfrequenz unterworfen wurde;
wenn das empfangene Signal basierend auf dem Beurteilungsergebnis als ein Träger betrachtet wird, Demodulation des empfangenen Signals, dessen Frequenz in die Zwischenfrequenz umgewandelt wurde, ausgeführt wird; und
Breitbandfilterung des empfangenen Signals durch das variable Bandpassfilter (16), das so gesteuert wird, dass es eine Breitbandcharakteristik aufweist, ausgeführt wird.

16. Störungsunterdrückungsverfahren gemäß Anspruch 11, das weiter den Schritt umfasst:

Durchführen einer Beurteilung einer Trägerprüfung (Carrier sense) basierend auf dem Erfassungsergebnis, wobei das Verfahren in einem Superheterodynempfänger ausgeführt wird;
Schmalbandfilterung des empfangenen Signals durch variable Tiefpassfilter (17, 18), die so gesteuert werden, dass sie eine Schmalbandcharakteristik aufweisen, ausgeführt wird;
das empfangene Signal einer Frequenzumwandlung von Funk- auf Basisbandfrequenz un-

terworfen wurde;
wenn das empfangene Signal basierend auf dem Beurteilungsergebnis als ein Träger betrachtet wird, Demodulation des empfangenen Signals, dessen Frequenz in die Basisbandfrequenz umgewandelt wurde, ausgeführt wird; und
Breitbandfilterung des empfangenen Signals durch die variablen Tiefpassfilter (17, 18), die so gesteuert werden, dass sie eine Breitbandcharakteristik aufweisen, ausgeführt wird.

17. Störungsunterdrückungsverfahren gemäß Anspruch 11, das weiter den Schritt umfasst:

Durchführen einer Beurteilung einer Trägerprüfung (Carrier sense) basierend auf dem Erfassungsergebnis, wobei das Verfahren in einem Direktmischempfänger ausgeführt wird;
Schmalbandfilterung des empfangenen Signals durch variable Tiefpassfilter (17, 18), die so gesteuert werden, dass sie eine Schmalbandcharakteristik aufweisen, ausgeführt wird;
das empfangene Signal einer Frequenzumwandlung von Funk- auf Basisbandfrequenz unterworfen wurde;
wenn das empfangene Signal basierend auf dem Beurteilungsergebnis als ein Träger betrachtet wird, Demodulation des empfangenen Signals, dessen Frequenz in die Basisbandfrequenz umgewandelt wurde, ausgeführt wird; und
Breitbandfilterung des empfangenen Signals durch die variablen Tiefpassfilter (17, 18), die so gesteuert werden, dass sie eine Breitbandcharakteristik aufweisen, ausgeführt wird.

18. Störungsunterdrückungsverfahren gemäß einem der Ansprüche 15 bis 17, wobei:

das variable Bandpassfilter oder die variablen Tiefpassfilter so gesteuert wird/werden, dass es/sie im Anfangszustand eine Schmalbandcharakteristik aufweist/aufweisen; und
die Schmalbandcharakteristik in eine Breitbandcharakteristik geändert wird, wenn das empfangene Signal basierend auf dem Beurteilungsergebnis der Trägerprüfung (carrier sense) als ein Träger betrachtet wird.

19. Störungsunterdrückungsverfahren gemäß Anspruch 12 oder 15, wobei:

das Bandpassfilter, das eine Schmalbandcharakteristik aufweist, mit einem Durchgangsband bereitgestellt ist, das schmaler als die durch Einkanalmodulation belegte Bandbreite ist; und
das Bandpassfilter, das eine Breitbandcharakteristik aufweist, mit einem Durchgangsband bereitgestellt ist, dass gleich oder breiter als die durch Einkanalmodulation belegte Bandbreite ist.

20. Störungsunterdrückungsverfahren gemäß einem der Ansprüche 13, 14, 16 und 17, wobei:

die Tiefpassfilter, die eine Schmalbandcharakteristik aufweisen, mit einem Durchgangsband bereitgestellt sind, das schmaler als die durch Einhalbkanalmodulation belegte Bandbreite ist; und
die Tiefpassfilter, die eine Breitbandcharakteristik aufweisen, mit einem Durchgangsband bereitgestellt sind, dass gleich oder breiter als die durch Einhalbkanalmodulation belegte Bandbreite ist.

Revendications

1. Système de communication radio par paquets comprenant un récepteur, le récepteur étant configuré pour utiliser le procédé d'accès multiple avec écoute de porteuse,
caractérisé en ce que le récepteur comprend un filtre à bande étroite configuré pour recevoir un signal, pour filtrer en bande étroite le signal et pour sortir le signal filtré en bande étroite vers un indicateur d'intensité du signal reçu ; et
le récepteur comprend un filtre à large bande configuré pour recevoir le signal, pour filtrer en large bande le signal par une bande plus large que celle du filtre à bande étroite et pour sortir le signal filtré en large bande vers un démodulateur.

2. Système selon la revendication 1, dans lequel :

le récepteur est un récepteur superhétérodyne ;
le filtre à bande étroite est un filtre passe-bande étroit (7) ;
l'indicateur d'intensité du signal reçu (8) est configuré pour effectuer une détection d'intensité de champ électrique pour le signal reçu qui a subi une conversion de fréquence d'une fréquence radio à une fréquence intermédiaire ;
le récepteur est configuré pour effectuer un jugement d'écoute de porteuse sur la base du résultat de détection ;
le démodulateur (9) est configuré pour démoduler le signal reçu dont la fréquence a été convertie en la fréquence intermédiaire dans le cas où le signal reçu est considéré comme une porteuse sur la base du résultat de jugement, et
le filtre à large bande est un filtre passe-bande large (6).

3. Système selon la revendication 1, dans lequel :

le récepteur est un récepteur superhétérodyne ;
le filtre à bande étroite est un filtre passe-bande à bande étroite (14, 15) ;
l'indicateur d'intensité du signal reçu (8) est configuré pour effectuer une détection d'intensité de champ électrique pour le signal reçu qui a subi une conversion de fréquence d'une fréquence radio à une fréquence en bande de base ;
le récepteur est configuré pour effectuer un jugement d'écoute de porteuse sur la base du résultat de détection ;
le démodulateur (9) est configuré pour effectuer une démodulation du signal reçu dont la fréquence a été convertie en la fréquence en bande de base dans le cas où le signal reçu est considéré comme une porteuse sur la base du résultat de jugement ; et
le filtre à large bande est un filtre passe-bas à large bande (12, 13).

4. Système selon la revendication 1, dans lequel :

le récepteur est un récepteur à conversion directe ;
le filtre à bande étroite est un filtre passe-bande à bande étroite (14, 15) ;
l'indicateur d'intensité du signal reçu (8) est configuré pour effectuer une détection d'intensité de champ électrique pour le signal reçu qui a subi une conversion de fréquence d'une fréquence radio à une fréquence en bande de base ;
le récepteur est configuré pour effectuer un jugement d'écoute de porteuse sur la base du résultat de détection ;
le démodulateur (9) est configuré pour effectuer une démodulation du signal reçu dont la fréquence a été convertie en la fréquence en bande de base dans le cas où le signal reçu est considéré comme une porteuse sur la base du résultat de jugement ; et
le filtre à large bande est un filtre passe-bas à large bande (12, 13).

5. Système selon la revendication 1, dans lequel :

le récepteur est un récepteur superhétérodyne ;
le filtre à bande étroite est un filtre passe-bande variable (16) commandé pour avoir une caractéristique de bande étroite ;
l'indicateur d'intensité du signal reçu (8) est configuré pour effectuer une détection d'intensité de champ électrique pour le signal reçu qui a subi une conversion de fréquence d'une fréquence radio à une fréquence intermédiaire ;
le récepteur est configuré pour effectuer un jugement d'écoute de porteuse sur la base du résultat de détection ;
le démodulateur (9) est configuré pour démoduler le signal reçu dont la fréquence a été convertie en la fréquence intermédiaire dans le cas où le signal reçu est considéré comme une porteuse sur la base du résultat de jugement, et
le filtre à large bande est le filtre passe-bande variable (16) commandé pour avoir une caractéristique de large bande.

6. Système selon la revendication 1, dans lequel :

le récepteur est un récepteur superhétérodyne ;
le filtre à bande étroite est un filtre passe-bas variable (17, 18) commandé pour avoir une caractéristique de bande étroite ;
l'indicateur d'intensité du signal reçu (8) est configuré pour effectuer une détection d'intensité de champ électrique pour le signal reçu qui a subi une conversion de fréquence d'une fréquence radio à une fréquence en bande de base ;
le récepteur est configuré pour effectuer un jugement d'écoute de porteuse sur la base du résultat de détection ;
le démodulateur (9) est configuré pour effectuer une démodulation du signal reçu dont la fréquence a été convertie en la fréquence en bande de base dans le cas où le signal reçu est considéré comme une porteuse sur la base du résultat de jugement, et
le filtre à large bande est le filtre passe-bas variable (17, 18) commandé pour avoir une caractéristique de large bande.

7. Système selon la revendication 1, dans lequel :

le récepteur est un récepteur à conversion directe ;
le filtre à bande étroite est un filtre passe-bas variable (17, 18) commandé pour avoir une caractéristique de bande étroite ;
l'indicateur d'intensité du signal reçu (8) est configuré pour effectuer une détection d'intensité de champ électrique pour le signal reçu qui a subi une conversion de fréquence d'une fréquence radio à une fréquence en bande de base ;
le récepteur est configuré pour effectuer un jugement d'écoute de porteuse sur la base du résultat de détection ;
le démodulateur (9) est configuré pour effectuer une démodulation du signal reçu dont la fréquence a été convertie en la fréquence en bande de base dans le cas où le signal reçu est considéré comme une porteuse sur la base du résul-

tat de jugement, et
le filtre à large bande est le filtre passe-bas variable (17, 18) commandé pour avoir une caractéristique de large bande.

8. Système selon l'une des revendications 5 à 7, dans lequel :

le récepteur est configuré pour commander le filtre passe-bande variable ou les filtres passe-bas variables pour avoir une caractéristique de bande étroite dans l'état initial ; et
pour changer la caractéristique de bande étroite en une caractéristique de large bande lorsque le signal reçu est considéré comme une porteuse sur la base du résultat de jugement d'écoute de porteuse.

9. Système selon la revendication 2 ou 5, dans lequel :

le filtre passe-bande ayant une caractéristique de bande étroite est pourvu d'une bande passante plus étroite qu'une largeur de bande occupée par une modulation d'un canal ; et
le filtre passe-bande ayant une caractéristique de large bande est pourvu d'une bande passante égale ou plus large que la largeur de bande occupée par une modulation d'un canal.

10. Système selon l'une des revendications 3, 4, 6 et 7, dans lequel :

les filtres passe-bas ayant une caractéristique de bande étroite sont pourvus d'une bande passante plus étroite qu'une largeur de bande occupée par une modulation d'un demi-canal ; et
les filtres passe-bas ayant une caractéristique de large bande sont pourvus d'une bande passante égale ou plus large que la largeur de bande occupée par une modulation d'un demi-canal.

11. Procédé de suppression d'interférence pour un récepteur dans un système de communication radio par paquets comprenant un récepteur utilisant le procédé d'accès multiple avec écoute de porteuse, **caractérise en ce qu'**il comprend les étapes consistant à :

détecter l'intensité de champ électrique d'un signal reçu après un filtrage à bande étroite ; et
démoduler le signal reçu après un filtrage à large bande qui filtre le signal reçu par une bande plus large que celle du filtrage à bande étroite.

12. Procédé de suppression d'interférence selon la revendication 11, comprenant en outre l'étape consistant à :

effectuer un jugement d'écoute de porteuse sur la base du résultat de détection, où
le procédé est effectué dans un récepteur superhétérodyne ;
le signal reçu a subi une conversion de fréquence d'une fréquence radio à une fréquence intermédiaire ;
un filtrage à bande étroite du signal reçu est effectué par un filtre passe-bande étroit (7) ;
dans le cas où le signal reçu est considéré comme une porteuse sur la base du résultat de jugement, une démodulation du signal reçu dont la fréquence a été convertie en la fréquence intermédiaire est effectuée ; et
un filtrage à large bande du signal reçu est effectué par un filtre passe-bande large (7).

13. Procédé de suppression d'interférence selon la revendication 11, comprenant en outre l'étape consistant à :

effectuer un jugement d'écoute de porteuse sur la base du résultat de détection,
dans lequel le procédé est effectué dans un récepteur à conversion directe ;
un filtrage à bande étroite du signal reçu est effectué par des filtres passe-bas à bande étroite (14, 15) ;
le signal reçu a subi une conversion de fréquence d'une fréquence radio à une fréquence en bande de base ;
dans le cas où le signal reçu est considéré comme une porteuse sur la base du résultat de jugement, une démodulation du signal reçu dont la fréquence a été convertie en la fréquence en bande de base est effectuée ; et
un filtrage à large bande du signal reçu est effectué par des filtre passe-bas à large bande (14, 15) .

14. Procédé de suppression d'interférence selon la revendication 11, comprenant en outre l'étape consistant à :

effectuer un jugement d'écoute de porteuse sur la base du résultat de détection,
dans lequel le procédé est effectué dans un récepteur à conversion directe ;
un filtrage à bande étroite du signal reçu est effectué par des filtres passe-bas à bande étroite (14, 15) ;
le signal reçu a subi une conversion de fréquence d'une fréquence radio à une fréquence en bande de base ;
dans le cas où le signal reçu est considéré comme une porteuse sur la base du résultat de jugement, une démodulation du signal reçu dont la fréquence a été convertie en la fréquence en

bande de base est effectuée ; et
un filtrage à large bande du signal reçu est effectué par des filtre passe-bas à large bande (14, 15) .

15. Procédé de suppression d'interférence selon la revendication 11, comprenant en outre l'étape consistant à :

effectuer un jugement d'écoute de porteuse sur la base du résultat de détection,
dans lequel le procédé est effectué dans un récepteur superhétérodyne ;
un filtrage à bande étroite du signal reçu est effectué par un filtre passe-bande variable (16) commandé pour avoir une caractéristique de bande étroite ;
le signal reçu a subi une conversion de fréquence d'une fréquence radio à une fréquence intermédiaire ;
dans le cas où le signal reçu est considéré comme une porteuse sur la base du résultat de jugement, une démodulation du signal reçu dont la fréquence a été convertie en la fréquence intermédiaire est effectuée ; et
un filtrage à large bande du signal reçu est effectué par le filtre passe-bande variable (16) commandé pour avoir une caractéristique de large bande.

16. Procédé de suppression d'interférence selon la revendication 11, comprenant en outre l'étape consistant à :

effectuer un jugement d'écoute de porteuse sur la base du résultat de détection,
dans lequel le procédé est effectué dans un récepteur superhétérodyne ;
un filtrage à bande étroite du signal reçu est effectué par des filtres passe-bas variables (17, 18) commandés pour avoir une caractéristique de bande étroite ;
le signal reçu a subi une conversion de fréquence d'une fréquence radio à une fréquence en bande de base ;
dans le cas où le signal reçu est considéré comme une porteuse sur la base du résultat de jugement, une démodulation du signal reçu dont la fréquence a été convertie en la fréquence en bande de base est effectuée ; et
un filtrage à large bande du signal reçu est effectué par les filtres passe-bas variables (17, 18) commandés pour avoir une caractéristique de large bande.

17. Procédé de suppression d'interférence selon la revendication 11, comprenant en outre l'étape consistant à :

effectuer un jugement d'écoute de porteuse sur la base du résultat de détection,
dans lequel le procédé est effectué dans un récepteur à conversion directe ;
un filtrage à bande étroite du signal reçu est effectué par des filtres passe-bas variables (17, 18) commandés pour avoir une caractéristique de bande étroite ;
le signal reçu a subi une conversion de fréquence d'une fréquence radio à une fréquence en bande de base ;
dans le cas où le signal reçu est considéré comme une porteuse sur la base du résultat de jugement, une démodulation du signal reçu dont la fréquence a été convertie en la fréquence en bande de base est effectuée ; et
un filtrage à large bande du signal reçu est effectué par les filtres passe-bas variables (17, 18) commandés pour avoir une caractéristique de large bande.

18. Procédé de suppression d'interférence selon l'une des revendications 15 à 17, dans lequel :

le filtre passe-bande variable ou les filtres passe-bas variables est/sont commandé/s pour avoir une caractéristique de bande étroite dans l'état initial ; et
la caractéristique de bande étroite est changée en une caractéristique de large bande lorsque le signal reçu est considéré comme une porteuse sur la base du résultat de jugement d'écoute de porteuse.

19. Procédé de suppression d'interférence selon la revendication 12 ou 15, dans lequel :

le filtre passe-bande ayant une caractéristique de bande étroite est pourvu d'une bande passante plus étroite qu'une largeur de bande occupée par une modulation d'un canal ; et
le filtre passe-bande ayant une caractéristique de large bande est pourvu d'une bande passante égale ou plus large que la largeur de bande occupée par une modulation d'un canal.

20. Procédé de suppression d'interférence selon l'une des revendications 13, 14, 16 et 17, dans lequel :

les filtres passe-bas ayant une caractéristique de bande étroite sont pourvus d'une bande passante plus étroite qu'une largeur de bande occupée par une modulation d'un demi-canal ; et
les filtres passe-bas ayant une caractéristique de large bande sont pourvus d'une bande passante égale ou plus large que la largeur de bande occupée par une modulation d'un demi-canal.

FIG. 1

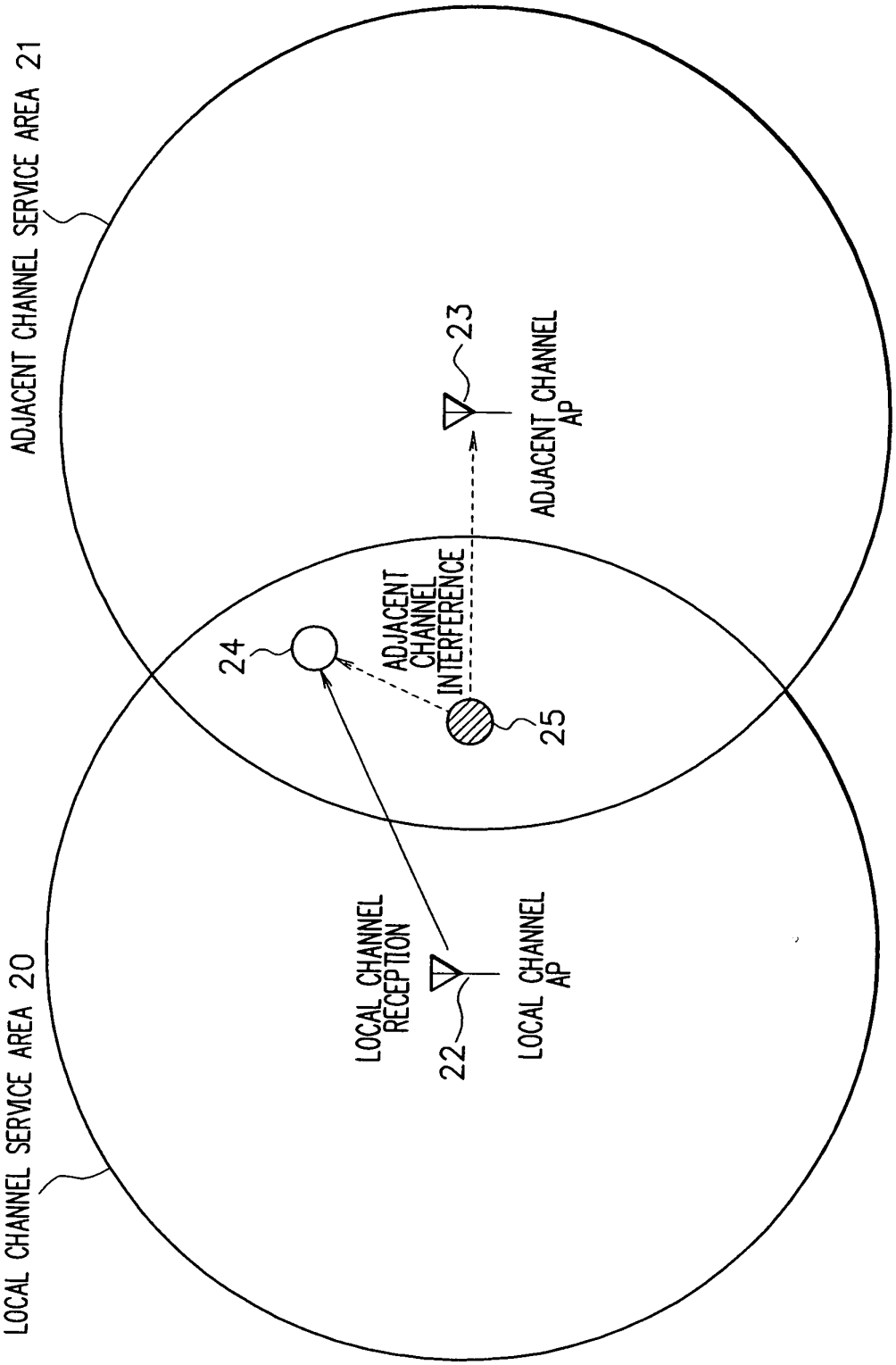

ADJACENT CHANNEL SERVICE AREA 21
LOCAL CHANNEL SERVICE AREA 20
23
ADJACENT CHANNEL AP
24
ADJACENT CHANNEL INTERFERENCE
25
LOCAL CHANNEL RECEPTION
22
LOCAL CHANNEL AP

FIG. 2

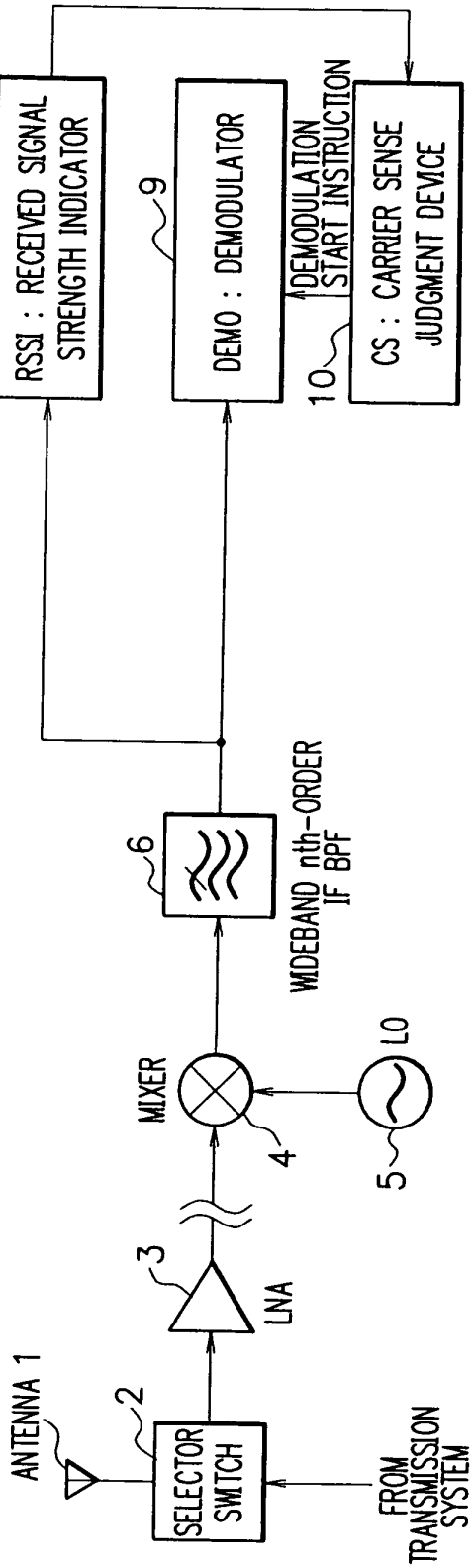

RSSI : RECEIVED SIGNAL STRENGTH INDICATOR
8
DEMO : DEMODULATOR
9
DEMODULATION START INSTRUCTION
CS : CARRIER SENSE JUDGMENT DEVICE
10
WIDEBAND nth-ORDER IF BPF
6
MIXER
4
LO
5
LNA
3
ANTENNA 1
SELECTOR SWITCH
2
FROM TRANSMISSION SYSTEM

FIG. 3

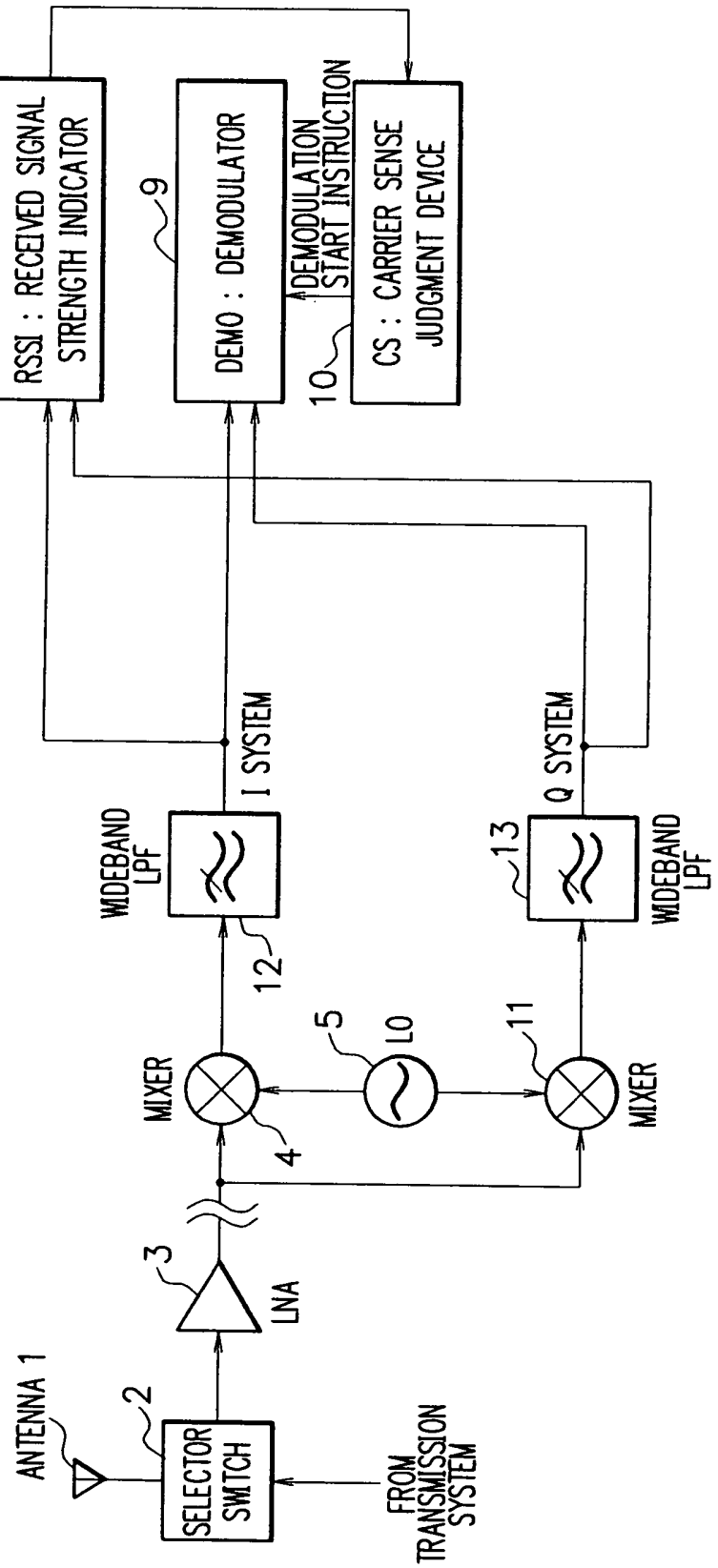

8
RSSI : RECEIVED SIGNAL STRENGTH INDICATOR
9
DEMO : DEMODULATOR
DEMODULATION START INSTRUCTION
10
CS : CARRIER SENSE JUDGMENT DEVICE
I SYSTEM
Q SYSTEM
WIDEBAND LPF
12
13
WIDEBAND LPF
MIXER
4
5
LO
11
MIXER
3
LNA
ANTENNA 1
2
SELECTOR SWITCH
FROM TRANSMISSION SYSTEM

FIG. 4

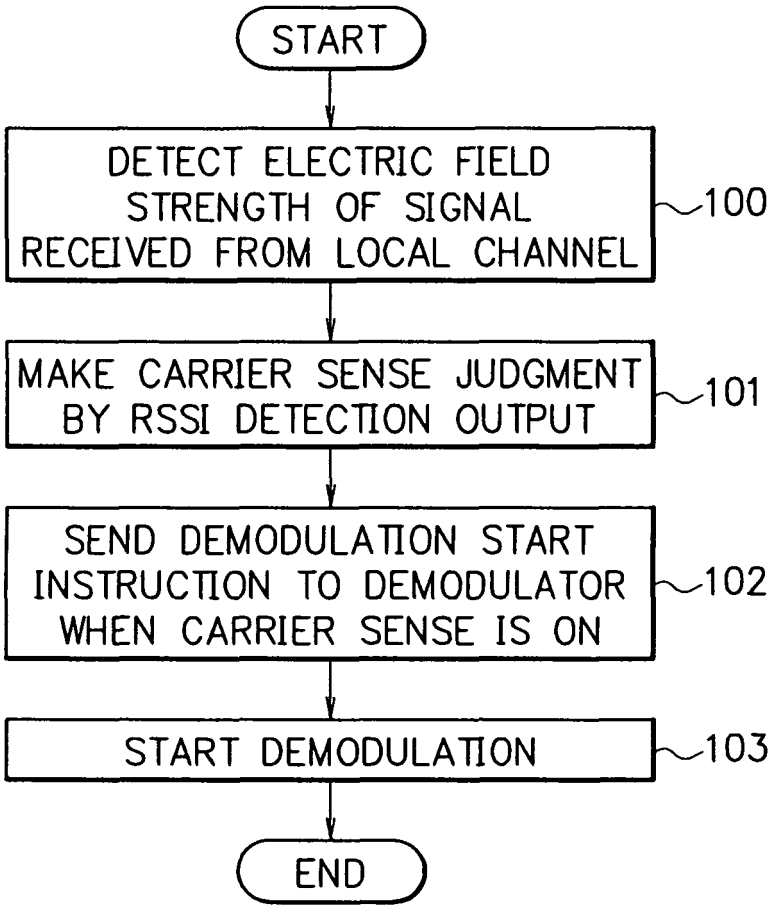

START
DETECT ELECTRIC FIELD STRENGTH OF SIGNAL RECEIVED FROM LOCAL CHANNEL
100
MAKE CARRIER SENSE JUDGMENT BY RSSI DETECTION OUTPUT
101
SEND DEMODULATION START INSTRUCTION TO DEMODULATOR WHEN CARRIER SENSE IS ON
102
START DEMODULATION
103
END

FIG. 5

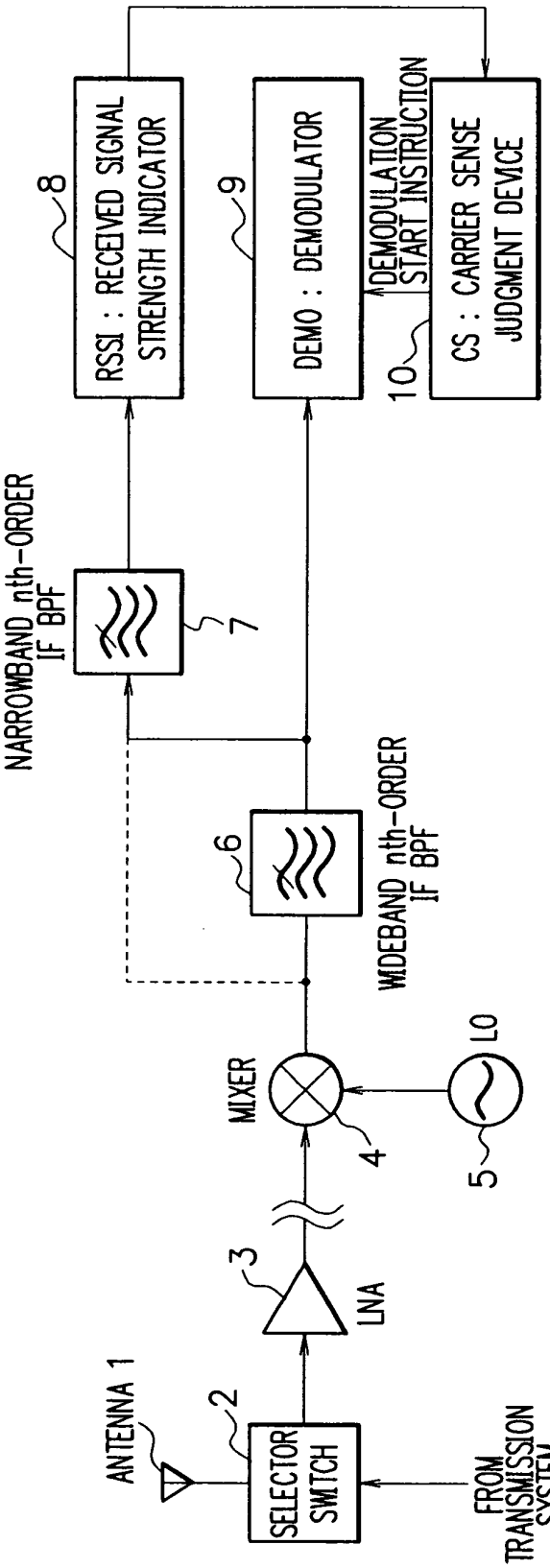

ANTENNA 1
2
SELECTOR SWITCH
FROM TRANSMISSION SYSTEM
3
LNA
MIXER
4
LO
5
6
WIDEBAND nth-ORDER IF BPF
NARROWBAND nth-ORDER IF BPF
7
8
RSSI : RECEIVED SIGNAL STRENGTH INDICATOR
9
DEMO : DEMODULATOR
DEMODULATION START INSTRUCTION
10
CS : CARRIER SENSE JUDGMENT DEVICE

FIG. 6

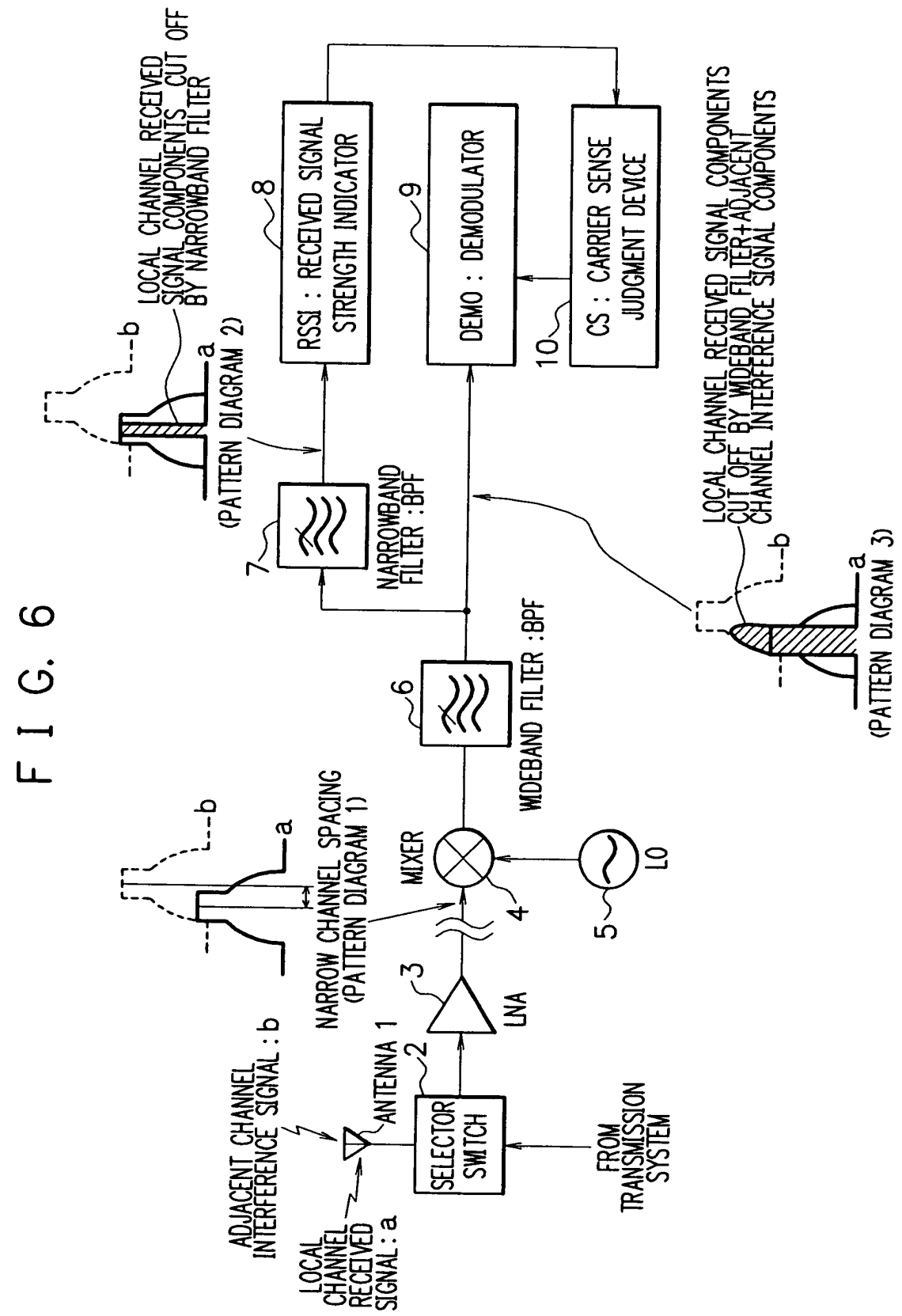

ADJACENT CHANNEL INTERFERENCE SIGNAL : b
LOCAL CHANNEL RECEIVED SIGNAL : a
ANTENNA 1
2
SELECTOR SWITCH
FROM TRANSMISSION SYSTEM
3
LNA
4
MIXER
5
LO
NARROW CHANNEL SPACING (PATTERN DIAGRAM 1)
6
WIDEBAND FILTER :BPF
7
NARROWBAND FILTER :BPF
8
RSSI : RECEIVED SIGNAL STRENGTH INDICATOR
9
DEMO : DEMODULATOR
10
CS : CARRIER SENSE JUDGMENT DEVICE
LOCAL CHANNEL RECEIVED SIGNAL COMPONENTS CUT OFF BY NARROWBAND FILTER
(PATTERN DIAGRAM 2)
LOCAL CHANNEL RECEIVED SIGNAL COMPONENTS CUT OFF BY WIDEBAND FILTER+ADJACENT CHANNEL INTERFERENCE SIGNAL COMPONENTS
(PATTERN DIAGRAM 3)

FIG. 7

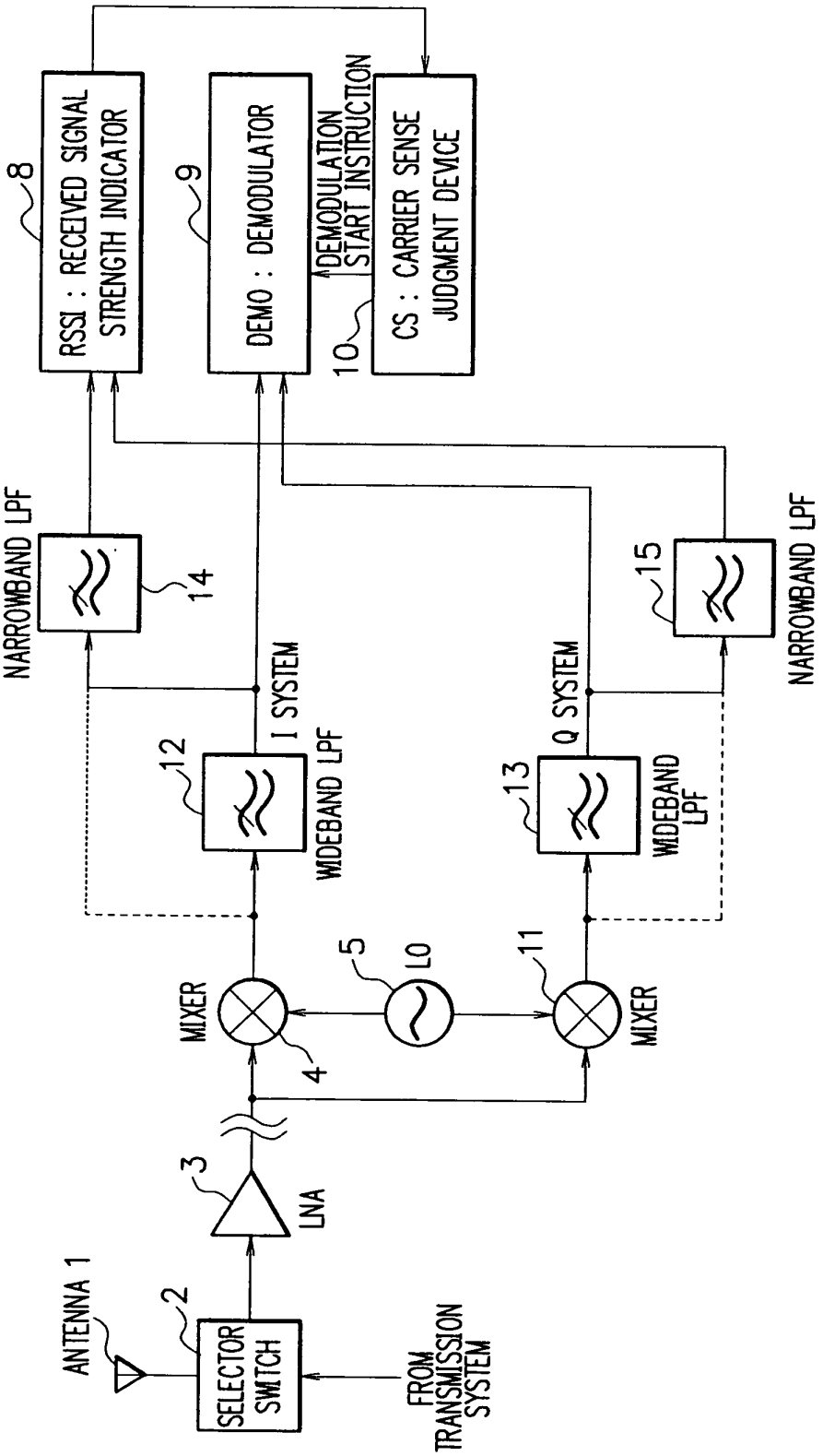

8
RSSI : RECEIVED SIGNAL STRENGTH INDICATOR
9
DEMO : DEMODULATOR
DEMODULATION START INSTRUCTION
10
CS : CARRIER SENSE JUDGMENT DEVICE
NARROWBAND LPF
14
15
NARROWBAND LPF
I SYSTEM
Q SYSTEM
12
WIDEBAND LPF
13
WIDEBAND LPF
MIXER
4
5
LO
11
MIXER
3
LNA
ANTENNA 1
2
SELECTOR SWITCH
FROM TRANSMISSION SYSTEM

FIG. 8

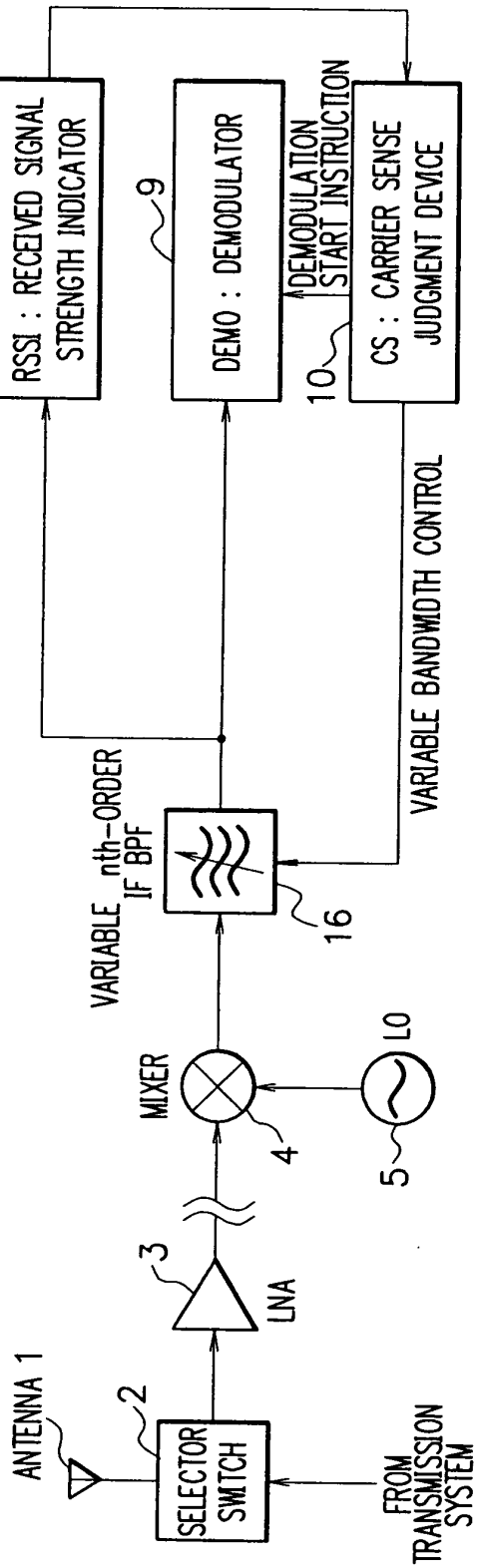
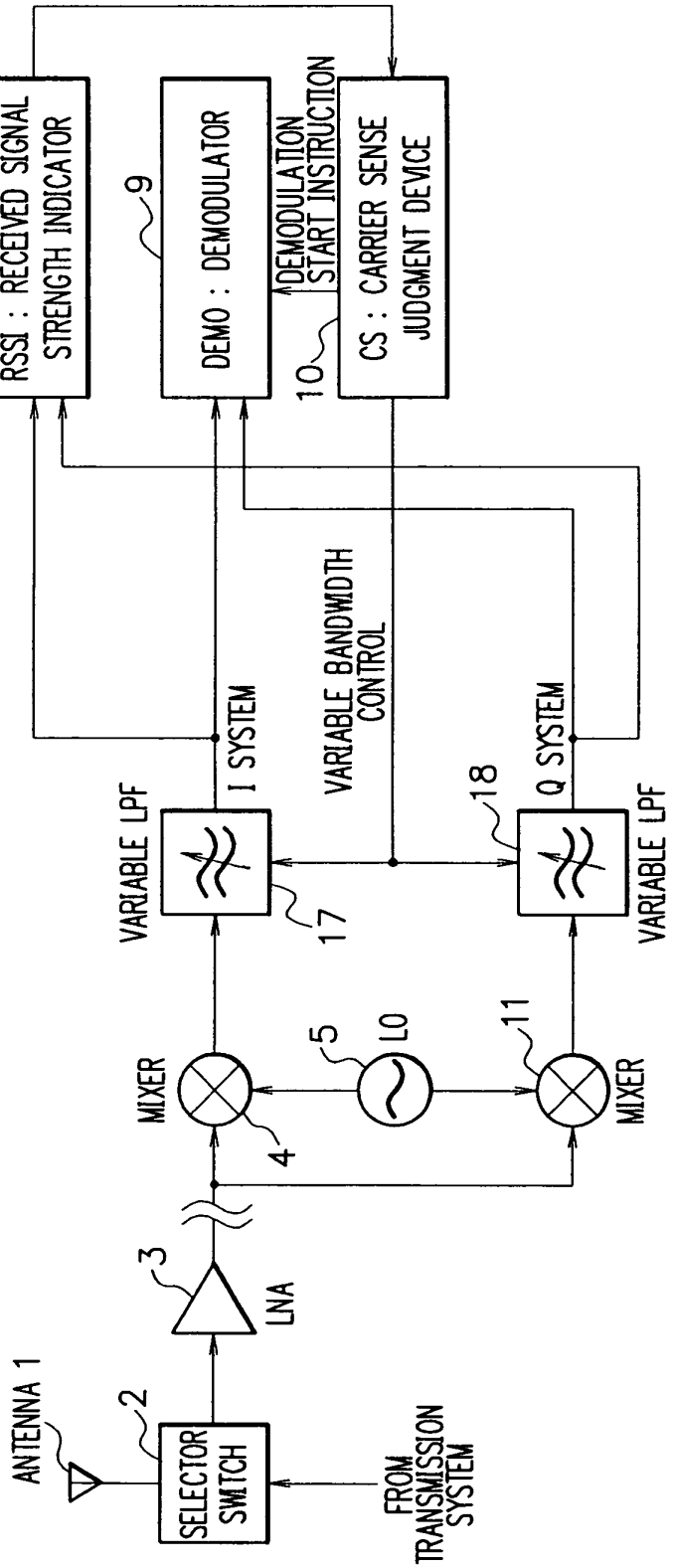

RSSI : RECEIVED SIGNAL STRENGTH INDICATOR
8
DEMO : DEMODULATOR
9
DEMODULATION START INSTRUCTION
CS : CARRIER SENSE JUDGMENT DEVICE
10
VARIABLE BANDWIDTH CONTROL
VARIABLE nth-ORDER IF BPF
16
MIXER
4
LO
5
LNA
3
SELECTOR SWITCH
2
ANTENNA 1
FROM TRANSMISSION SYSTEM

FIG. 9


8
RSSI : RECEIVED SIGNAL STRENGTH INDICATOR
9
DEMO : DEMODULATOR
DEMODULATION START INSTRUCTION
10
CS : CARRIER SENSE JUDGMENT DEVICE
VARIABLE BANDWIDTH CONTROL
I SYSTEM
Q SYSTEM
VARIABLE LPF
17
18
VARIABLE LPF
MIXER
4
5
LO
11
MIXER
3
LNA
ANTENNA 1
2
SELECTOR SWITCH
FROM TRANSMISSION SYSTEM

REFERENCES CITED IN THE DESCRIPTION

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